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OCT 10 2006
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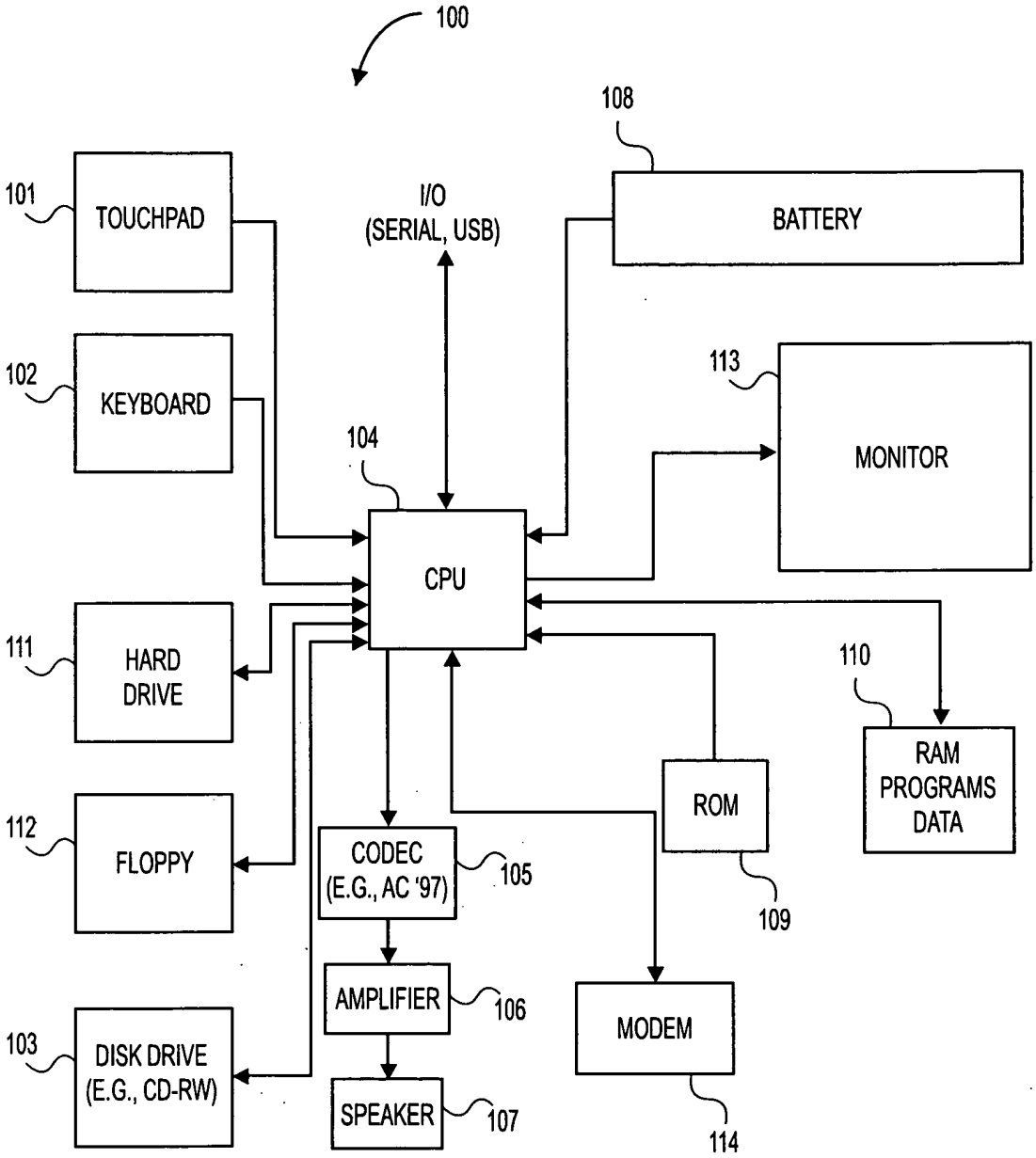

FIG. 1
(PRIOR ART)

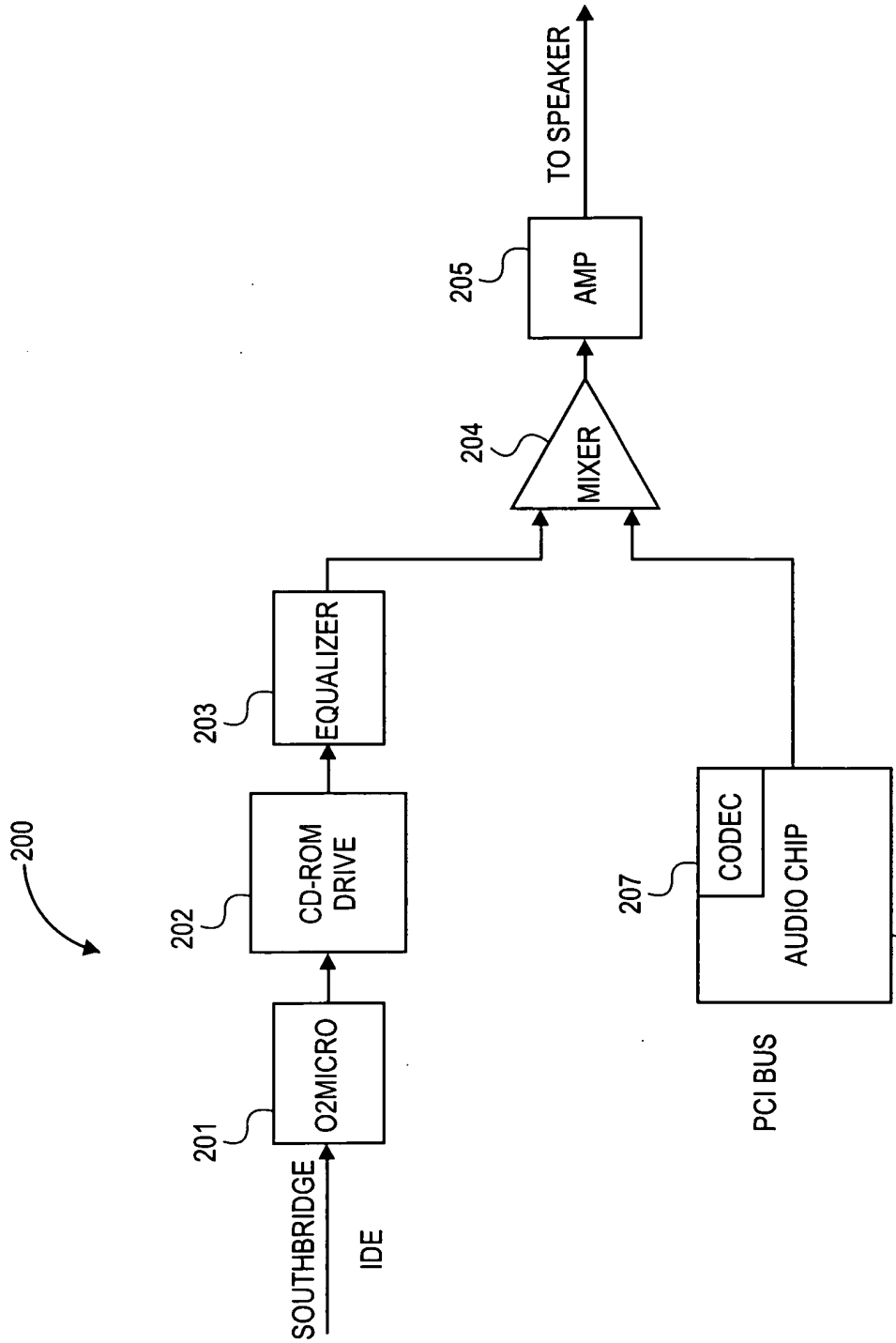

FIG. 2
(PRIOR ART)

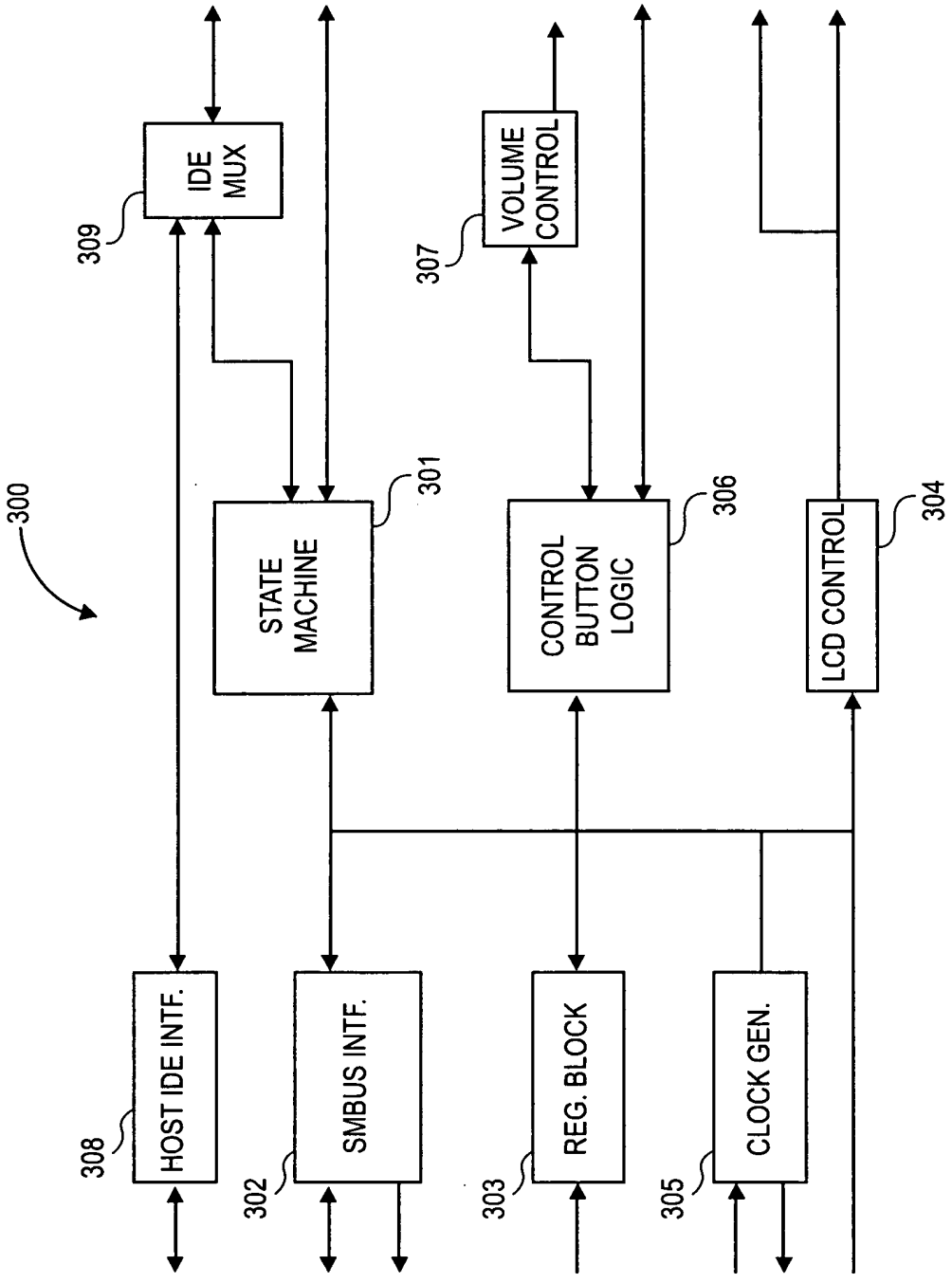

FIG. 3
(PRIOR ART)

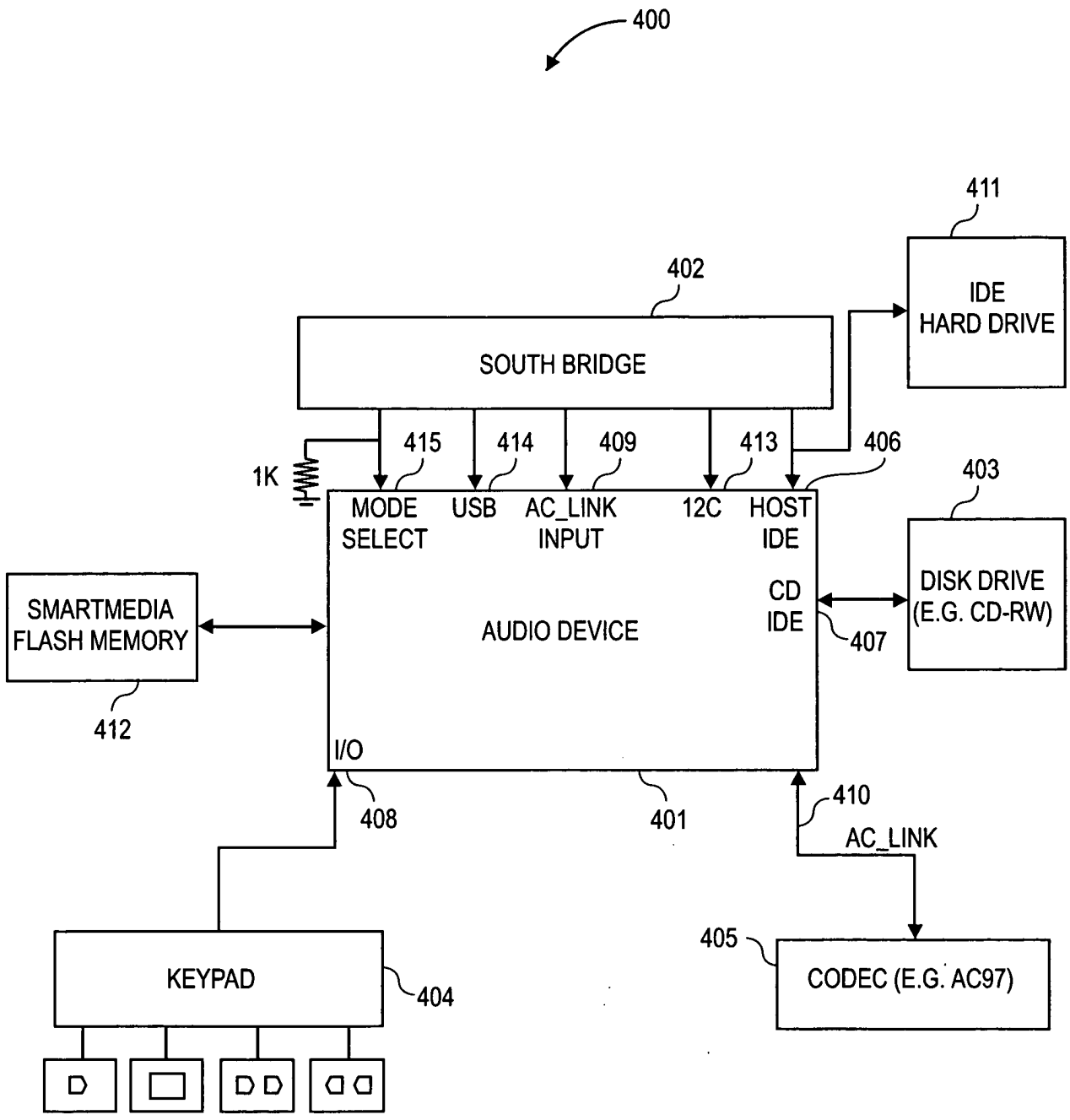
400
411
IDE
HARD DRIVE
402
SOUTH BRIDGE
415
414
409
413
406
1K
403
MODE
SELECT
USB
AC_LINK
INPUT
12C
HOST
IDE
SMARTMEDIA
FLASH MEMORY
AUDIO DEVICE
CD
IDE
DISK DRIVE
(E.G. CD-RW)
407
412
I/O
408
401
410
AC_LINK
405
KEYPAD
404
CODEC (E.G. AC97)

FIG. 4

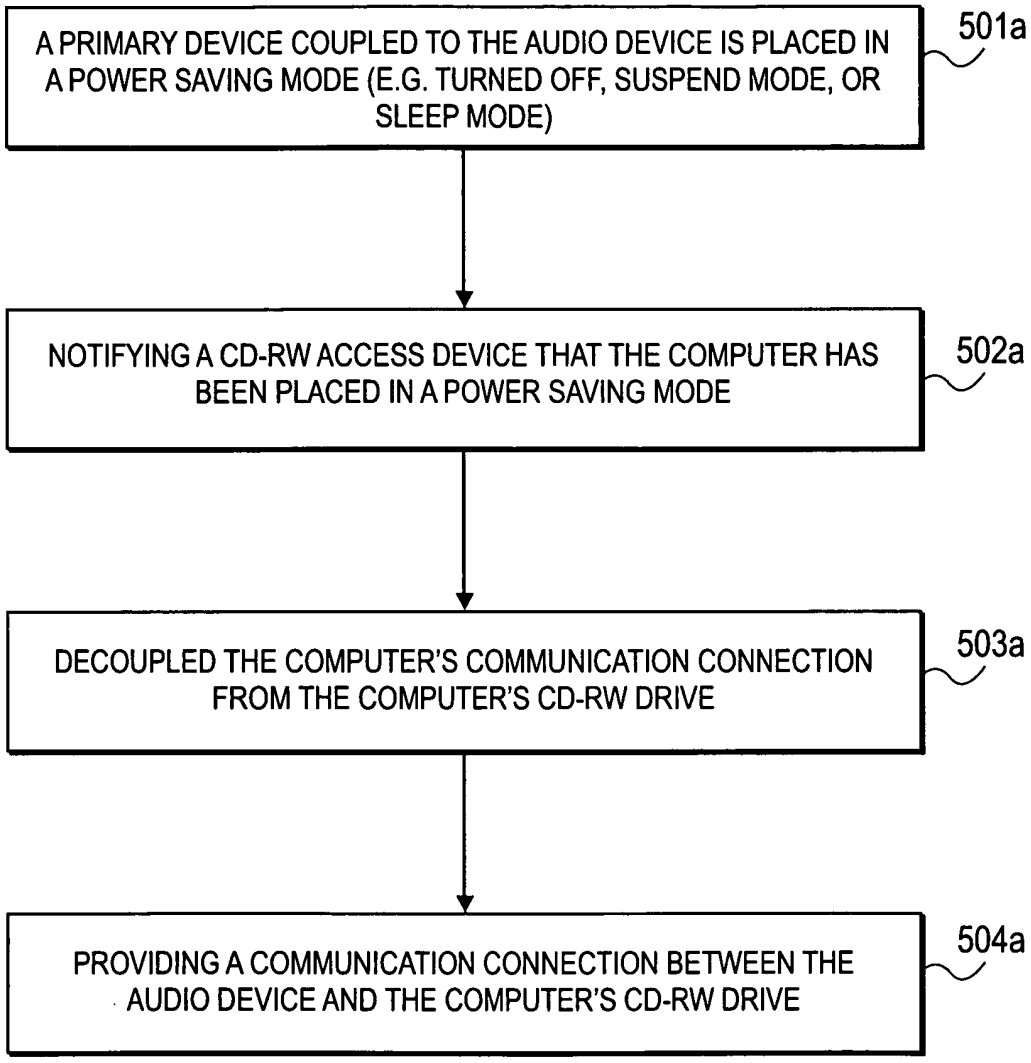
A PRIMARY DEVICE COUPLED TO THE AUDIO DEVICE IS PLACED IN A POWER SAVING MODE (E.G. TURNED OFF, SUSPEND MODE, OR SLEEP MODE)
501a
NOTIFYING A CD-RW ACCESS DEVICE THAT THE COMPUTER HAS BEEN PLACED IN A POWER SAVING MODE
502a
DECOUPLED THE COMPUTER'S COMMUNICATION CONNECTION FROM THE COMPUTER'S CD-RW DRIVE
503a
PROVIDING A COMMUNICATION CONNECTION BETWEEN THE AUDIO DEVICE AND THE COMPUTER'S CD-RW DRIVE
504a

FIG. 5A

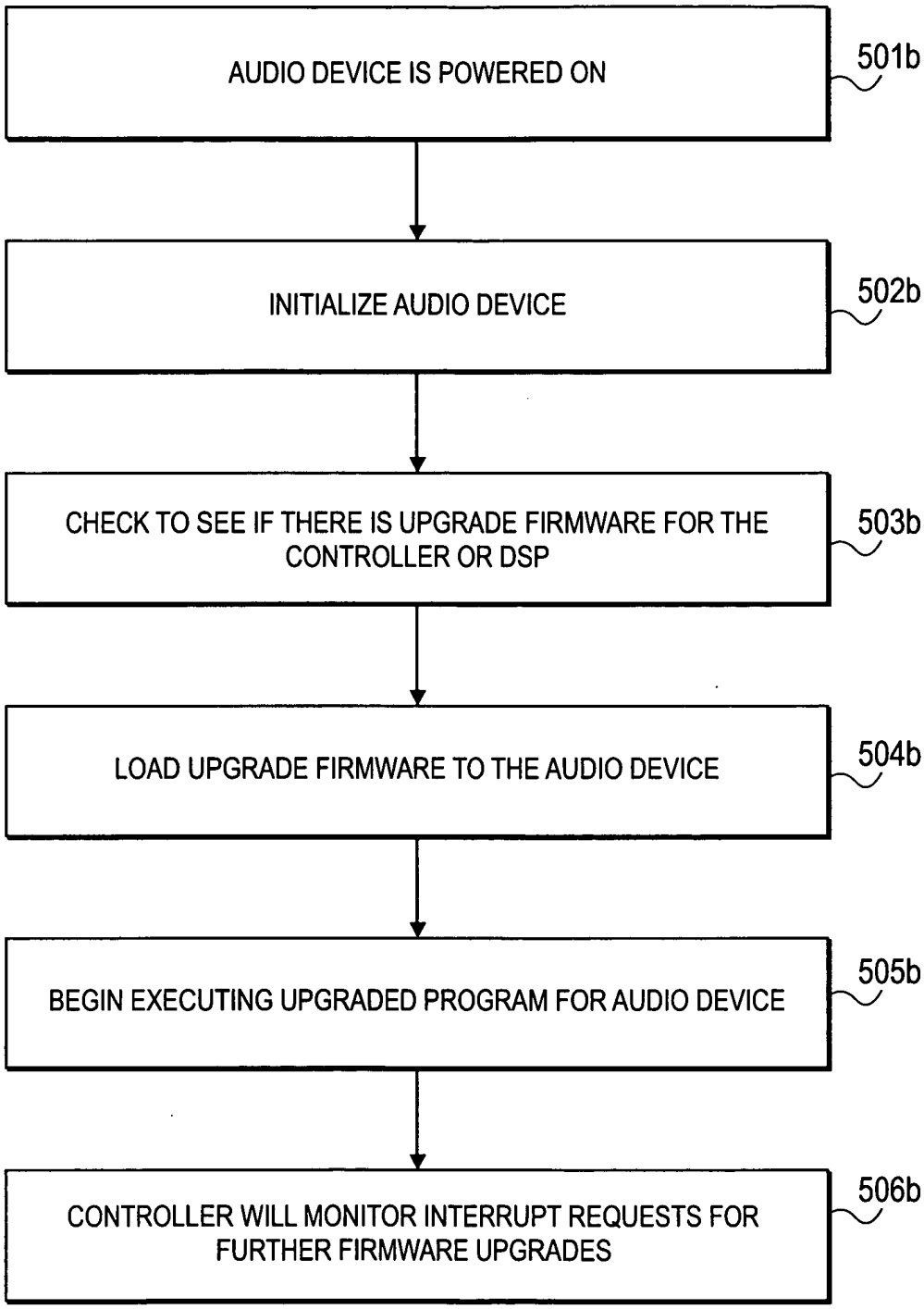
AUDIO DEVICE IS POWERED ON
501b
INITIALIZE AUDIO DEVICE
502b
CHECK TO SEE IF THERE IS UPGRADE FIRMWARE FOR THE CONTROLLER OR DSP
503b
LOAD UPGRADE FIRMWARE TO THE AUDIO DEVICE
504b
BEGIN EXECUTING UPGRADED PROGRAM FOR AUDIO DEVICE
505b
CONTROLLER WILL MONITOR INTERRUPT REQUESTS FOR FURTHER FIRMWARE UPGRADES
506b

FIG. 5B

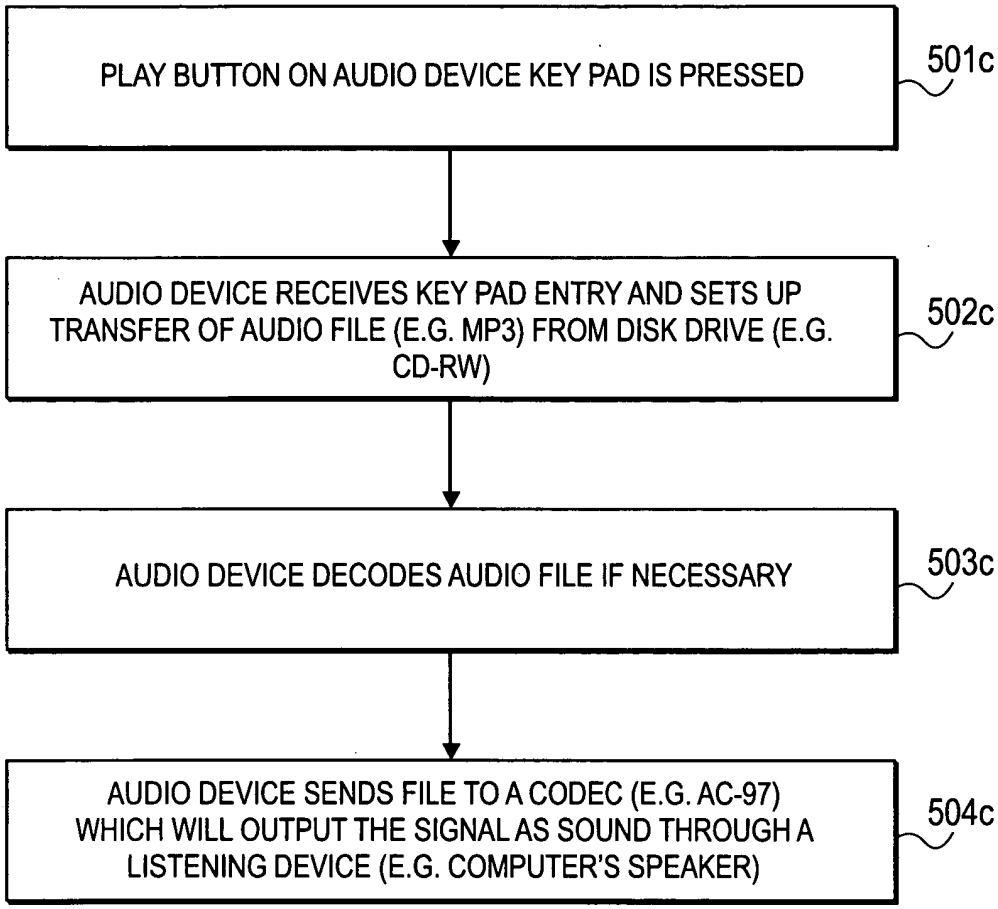
PLAY BUTTON ON AUDIO DEVICE KEY PAD IS PRESSED
501c
AUDIO DEVICE RECEIVES KEY PAD ENTRY AND SETS UP TRANSFER OF AUDIO FILE (E.G. MP3) FROM DISK DRIVE (E.G. CD-RW)
502c
AUDIO DEVICE DECODES AUDIO FILE IF NECESSARY
503c
AUDIO DEVICE SENDS FILE TO A CODEC (E.G. AC-97) WHICH WILL OUTPUT THE SIGNAL AS SOUND THROUGH A LISTENING DEVICE (E.G. COMPUTER'S SPEAKER)
504c

FIG. 5C

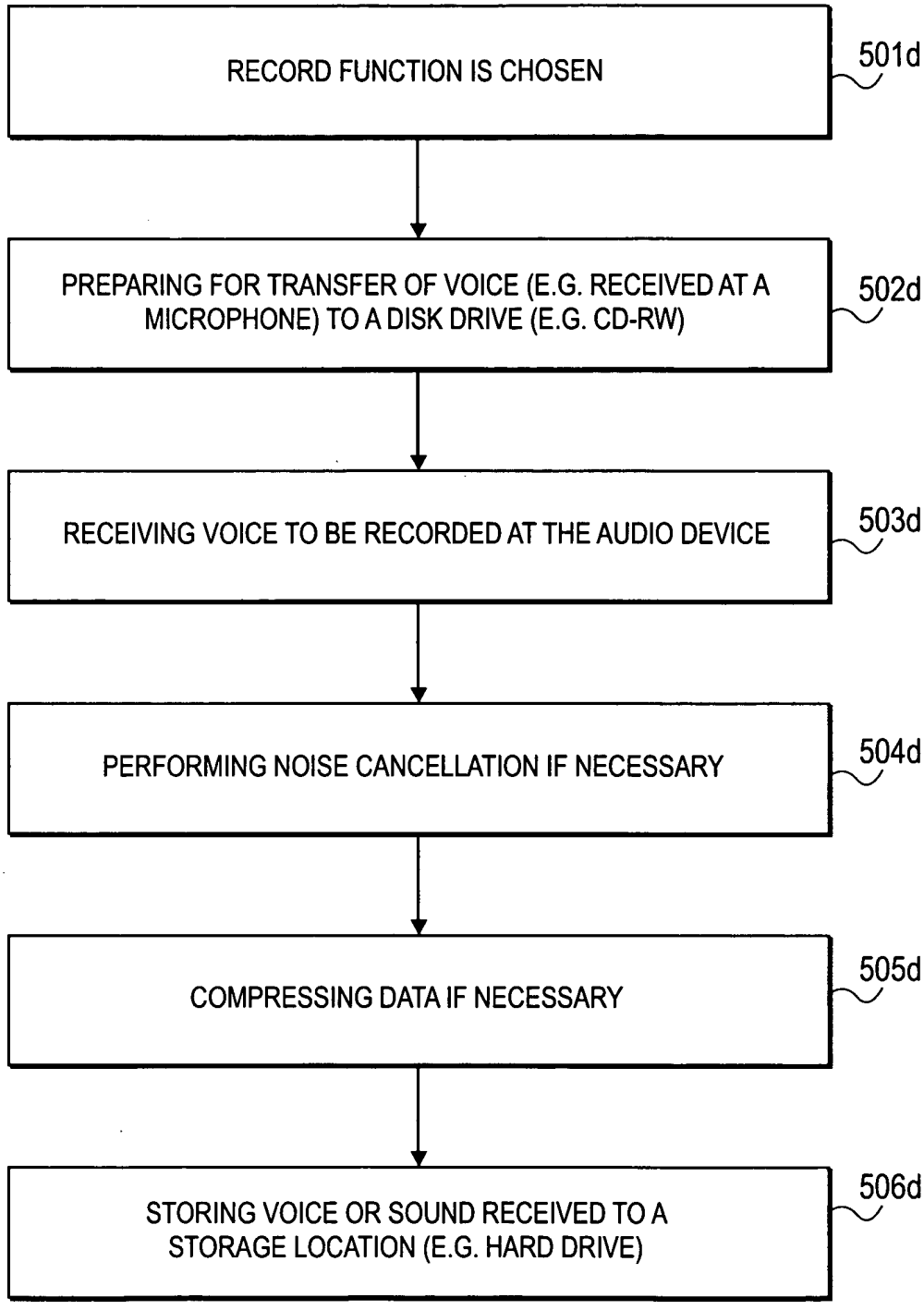
RECORD FUNCTION IS CHOSEN
501d
PREPARING FOR TRANSFER OF VOICE (E.G. RECEIVED AT A MICROPHONE) TO A DISK DRIVE (E.G. CD-RW)
502d
RECEIVING VOICE TO BE RECORDED AT THE AUDIO DEVICE
503d
PERFORMING NOISE CANCELLATION IF NECESSARY
504d
COMPRESSING DATA IF NECESSARY
505d
STORING VOICE OR SOUND RECEIVED TO A STORAGE LOCATION (E.G. HARD DRIVE)
506d

FIG. 5D

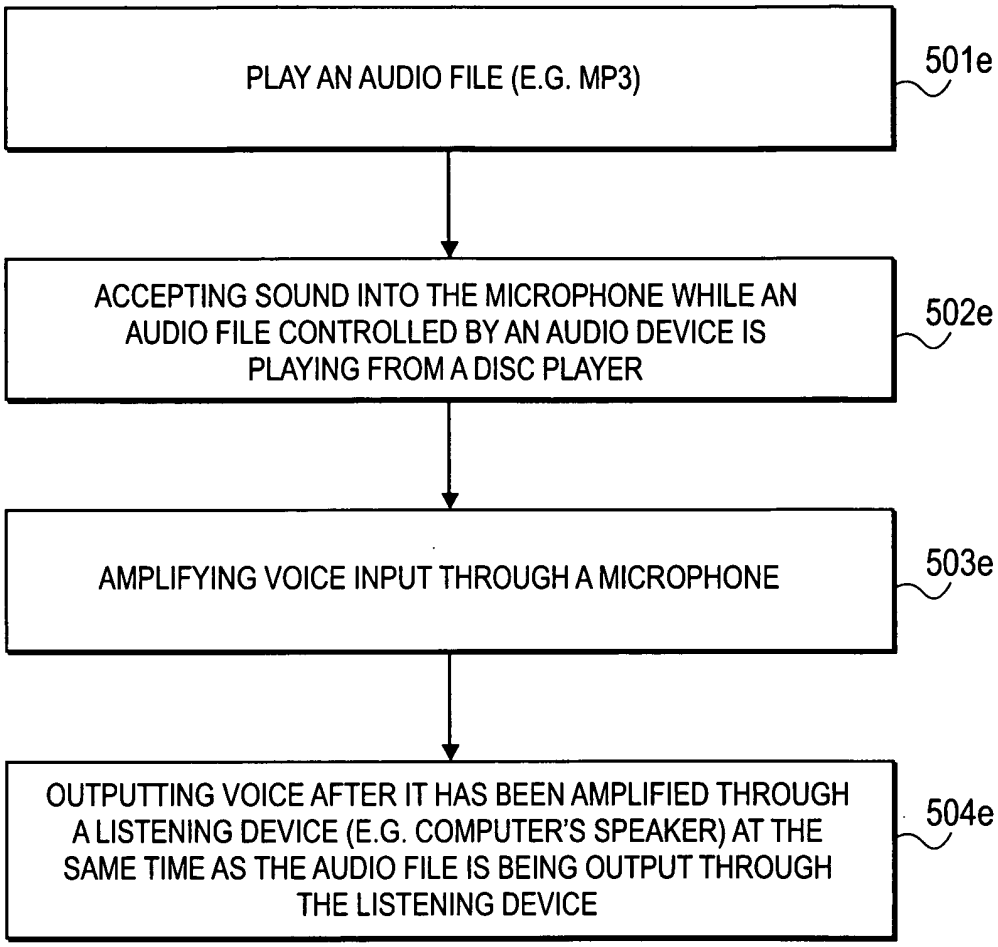
PLAY AN AUDIO FILE (E.G. MP3)
501e
ACCEPTING SOUND INTO THE MICROPHONE WHILE AN AUDIO FILE CONTROLLED BY AN AUDIO DEVICE IS PLAYING FROM A DISC PLAYER
502e
AMPLIFYING VOICE INPUT THROUGH A MICROPHONE
503e
OUTPUTTING VOICE AFTER IT HAS BEEN AMPLIFIED THROUGH A LISTENING DEVICE (E.G. COMPUTER'S SPEAKER) AT THE SAME TIME AS THE AUDIO FILE IS BEING OUTPUT THROUGH THE LISTENING DEVICE
504e

FIG. 5E

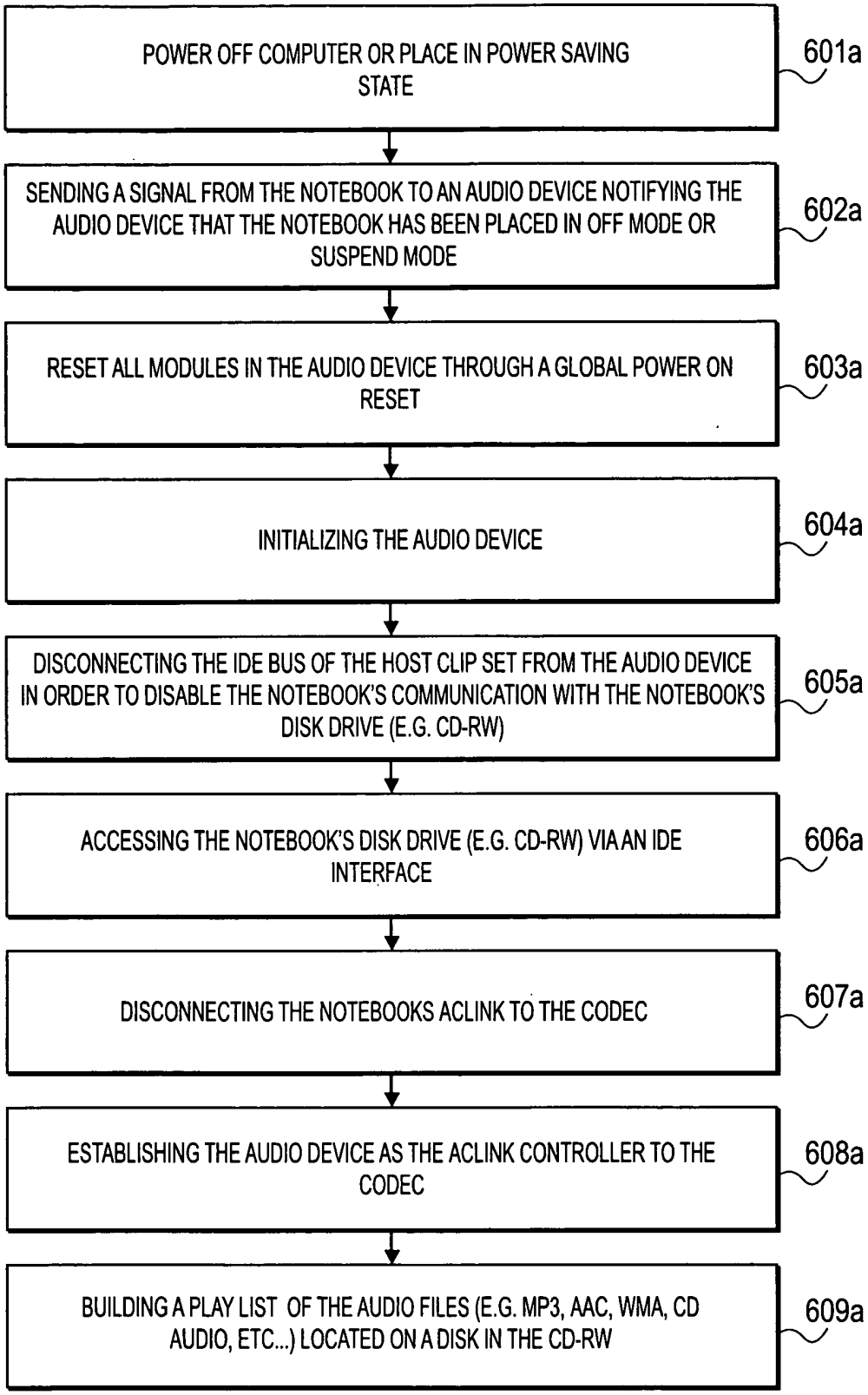
POWER OFF COMPUTER OR PLACE IN POWER SAVING STATE
601a
SENDING A SIGNAL FROM THE NOTEBOOK TO AN AUDIO DEVICE NOTIFYING THE AUDIO DEVICE THAT THE NOTEBOOK HAS BEEN PLACED IN OFF MODE OR SUSPEND MODE
602a
RESET ALL MODULES IN THE AUDIO DEVICE THROUGH A GLOBAL POWER ON RESET
603a
INITIALIZING THE AUDIO DEVICE
604a
DISCONNECTING THE IDE BUS OF THE HOST CLIP SET FROM THE AUDIO DEVICE IN ORDER TO DISABLE THE NOTEBOOK'S COMMUNICATION WITH THE NOTEBOOK'S DISK DRIVE (E.G. CD-RW)
605a
ACCESSING THE NOTEBOOK'S DISK DRIVE (E.G. CD-RW) VIA AN IDE INTERFACE
606a
DISCONNECTING THE NOTEBOOKS ACLINK TO THE CODEC
607a
ESTABLISHING THE AUDIO DEVICE AS THE ACLINK CONTROLLER TO THE CODEC
608a
BUILDING A PLAY LIST OF THE AUDIO FILES (E.G. MP3, AAC, WMA, CD AUDIO, ETC...) LOCATED ON A DISK IN THE CD-RW
609a

FIG. 6A

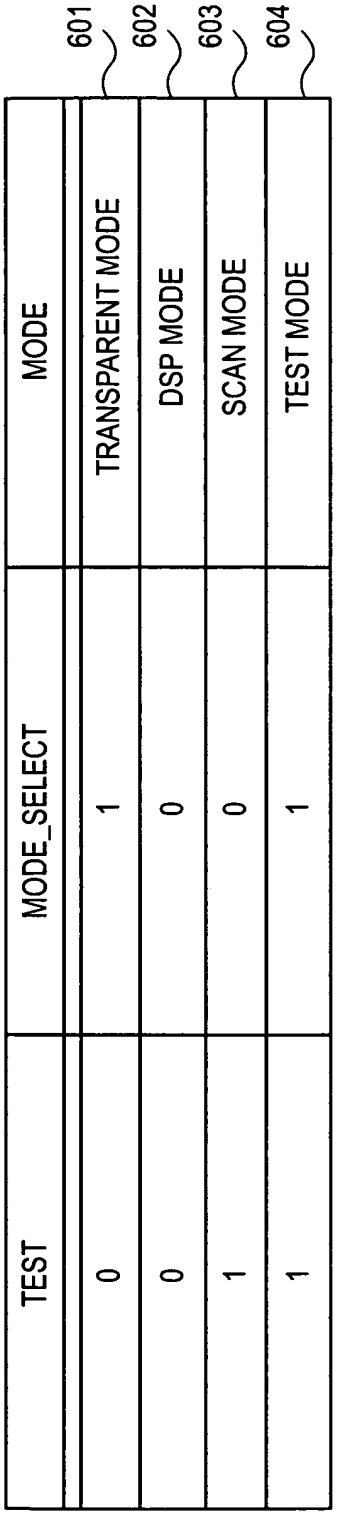
601
602
603
604
MODE
MODE_SELECT
TEST
TRANSPARENT MODE
1
0
DSP MODE
0
0
SCAN MODE
0
1
TEST MODE
1
1

FIG. 6B

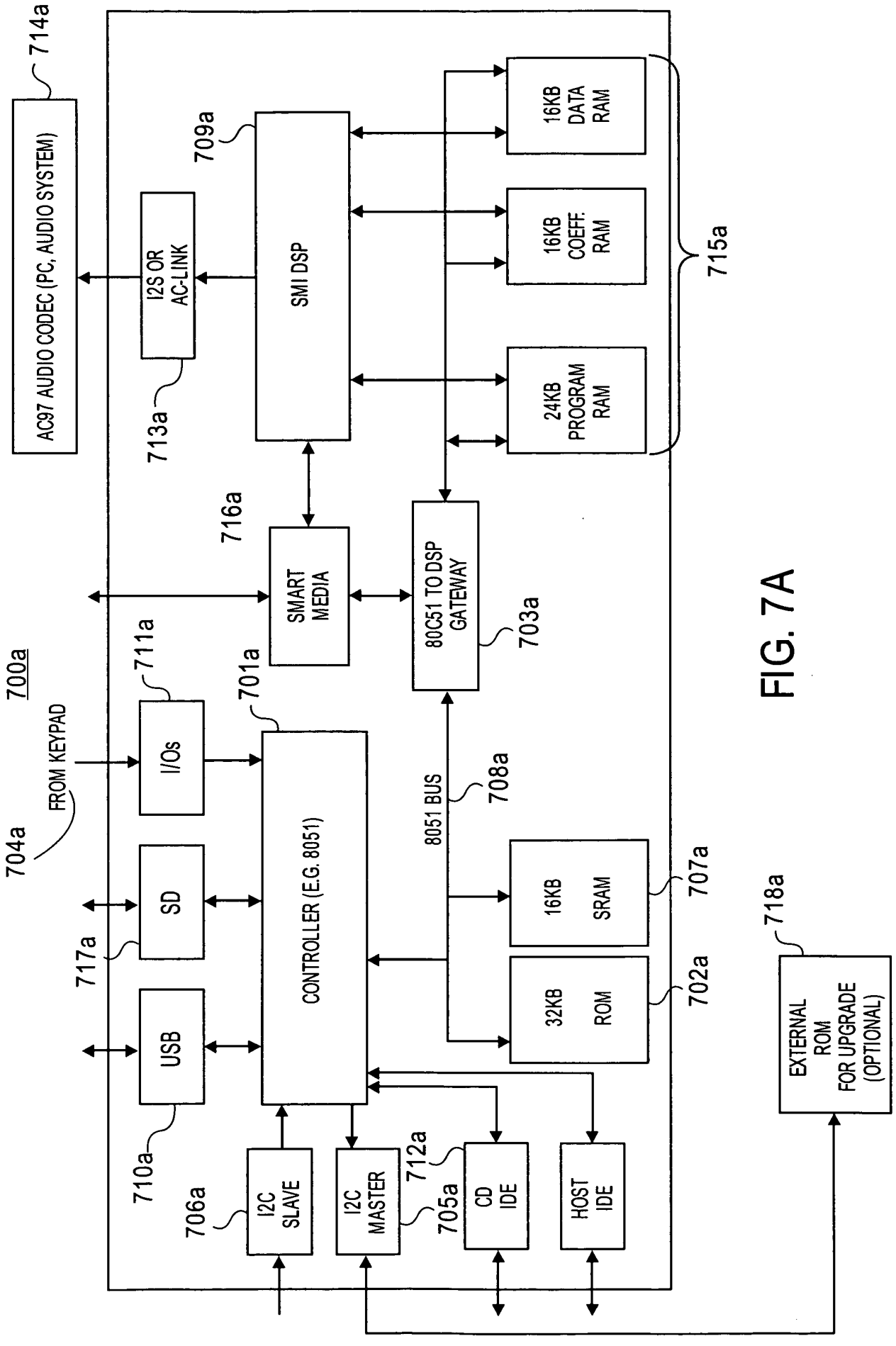
700a
714a
AC97 AUDIO CODEC (PC, AUDIO SYSTEM)
I2S OR AC-LINK
713a
709a
SMI DSP
16KB DATA RAM
16KB COEFF. RAM
24KB PROGRAM RAM
715a
716a
SMART MEDIA
80C51 TO DSP GATEWAY
703a
711a
701a
I/Os
FROM KEYPAD
704a
SD
717a
USB
710a
CONTROLLER (E.G. 8051)
8051 BUS
708a
16KB SRAM
707a
32KB ROM
702a
718a
EXTERNAL ROM FOR UPGRADE (OPTIONAL)
706a
I2C SLAVE
I2C MASTER
712a
705a
CD IDE
HOST IDE

FIG. 7A

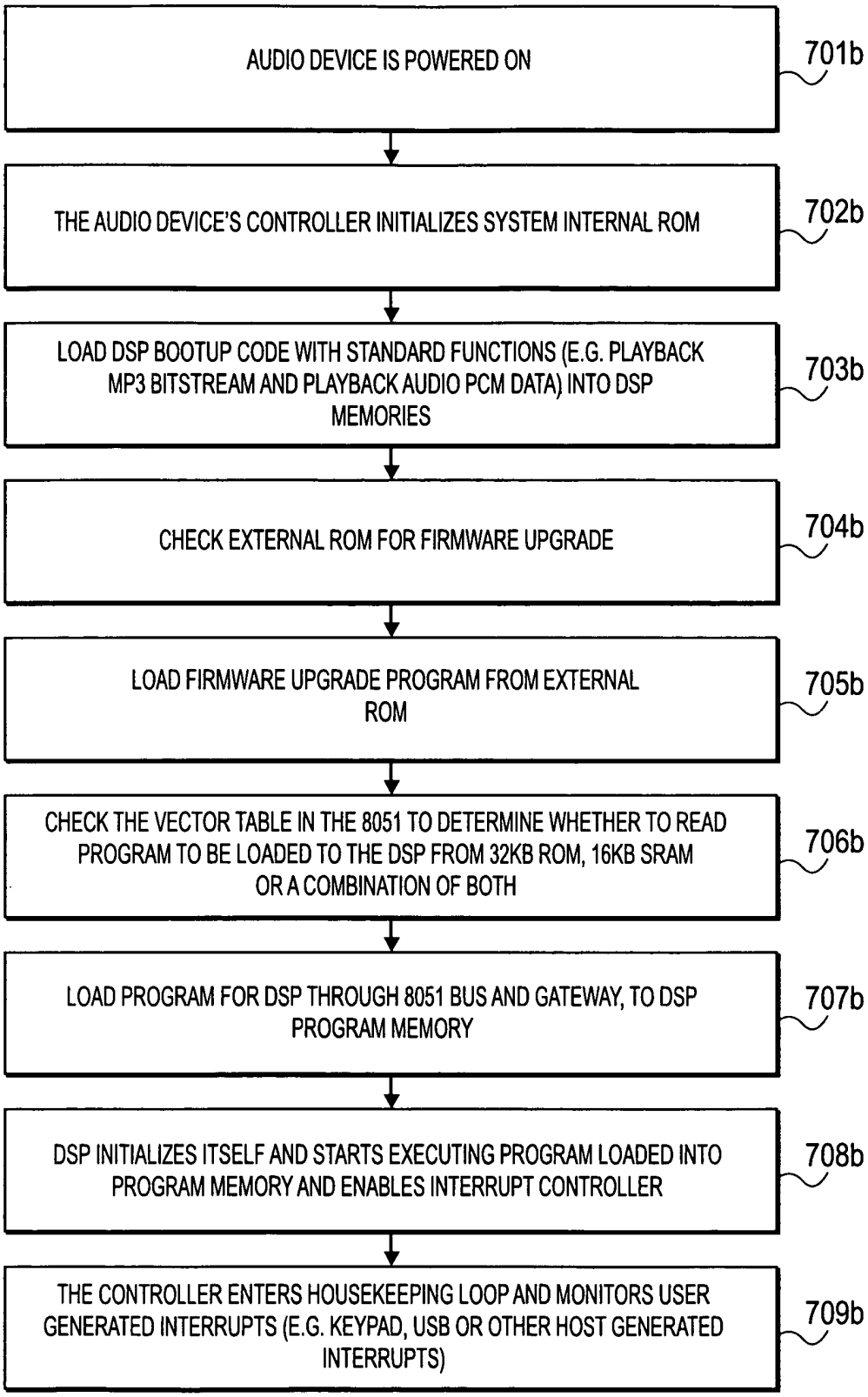
AUDIO DEVICE IS POWERED ON
701b
THE AUDIO DEVICE'S CONTROLLER INITIALIZES SYSTEM INTERNAL ROM
702b
LOAD DSP BOOTUP CODE WITH STANDARD FUNCTIONS (E.G. PLAYBACK MP3 BITSTREAM AND PLAYBACK AUDIO PCM DATA) INTO DSP MEMORIES
703b
CHECK EXTERNAL ROM FOR FIRMWARE UPGRADE
704b
LOAD FIRMWARE UPGRADE PROGRAM FROM EXTERNAL ROM
705b
CHECK THE VECTOR TABLE IN THE 8051 TO DETERMINE WHETHER TO READ PROGRAM TO BE LOADED TO THE DSP FROM 32KB ROM, 16KB SRAM OR A COMBINATION OF BOTH
706b
LOAD PROGRAM FOR DSP THROUGH 8051 BUS AND GATEWAY, TO DSP PROGRAM MEMORY
707b
DSP INITIALIZES ITSELF AND STARTS EXECUTING PROGRAM LOADED INTO PROGRAM MEMORY AND ENABLES INTERRUPT CONTROLLER
708b
THE CONTROLLER ENTERS HOUSEKEEPING LOOP AND MONITORS USER GENERATED INTERRUPTS (E.G. KEYPAD, USB OR OTHER HOST GENERATED INTERRUPTS)
709b

FIG. 7B

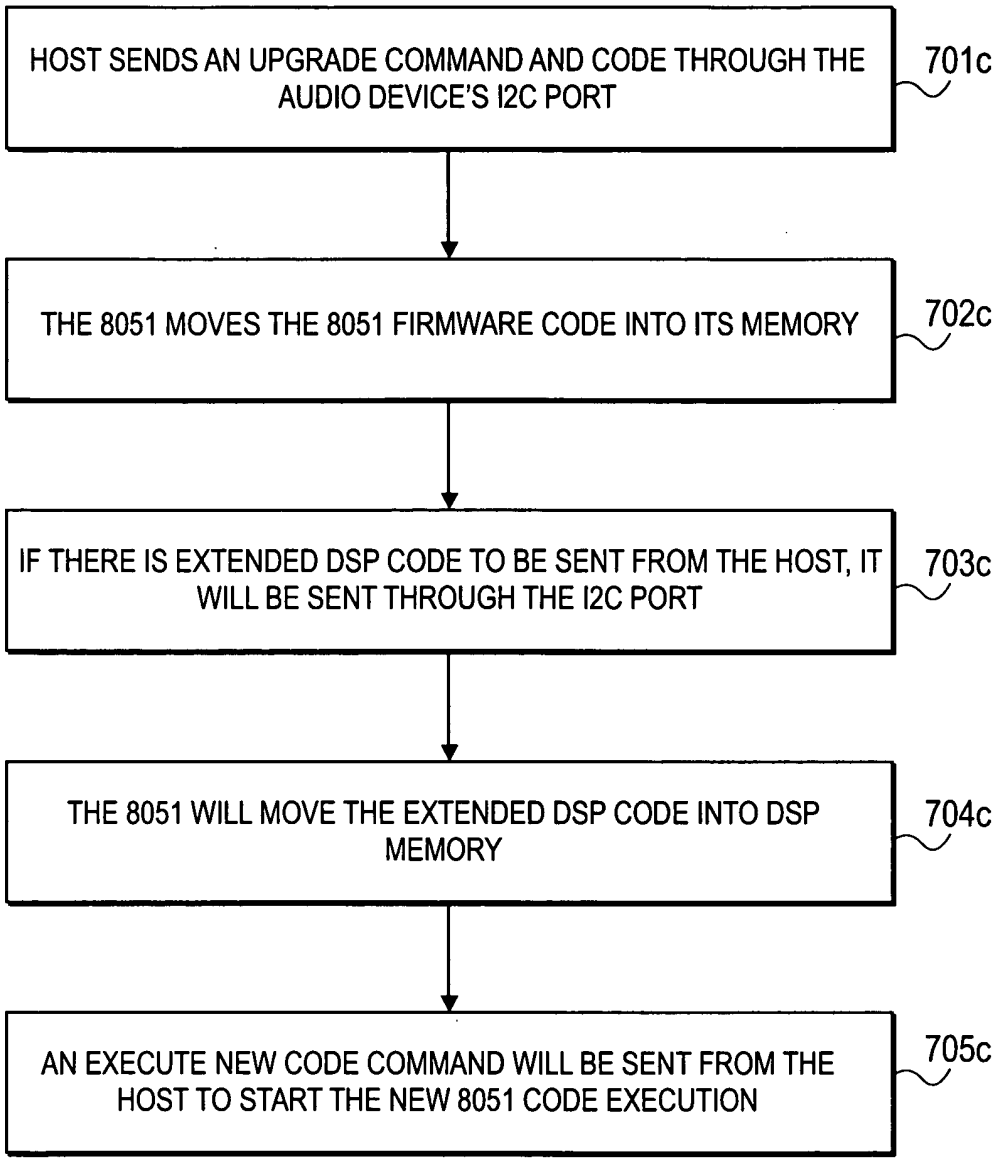
HOST SENDS AN UPGRADE COMMAND AND CODE THROUGH THE AUDIO DEVICE'S I2C PORT
701c
THE 8051 MOVES THE 8051 FIRMWARE CODE INTO ITS MEMORY
702c
IF THERE IS EXTENDED DSP CODE TO BE SENT FROM THE HOST, IT WILL BE SENT THROUGH THE I2C PORT
703c
THE 8051 WILL MOVE THE EXTENDED DSP CODE INTO DSP MEMORY
704c
AN EXECUTE NEW CODE COMMAND WILL BE SENT FROM THE HOST TO START THE NEW 8051 CODE EXECUTION
705c

FIG. 7C

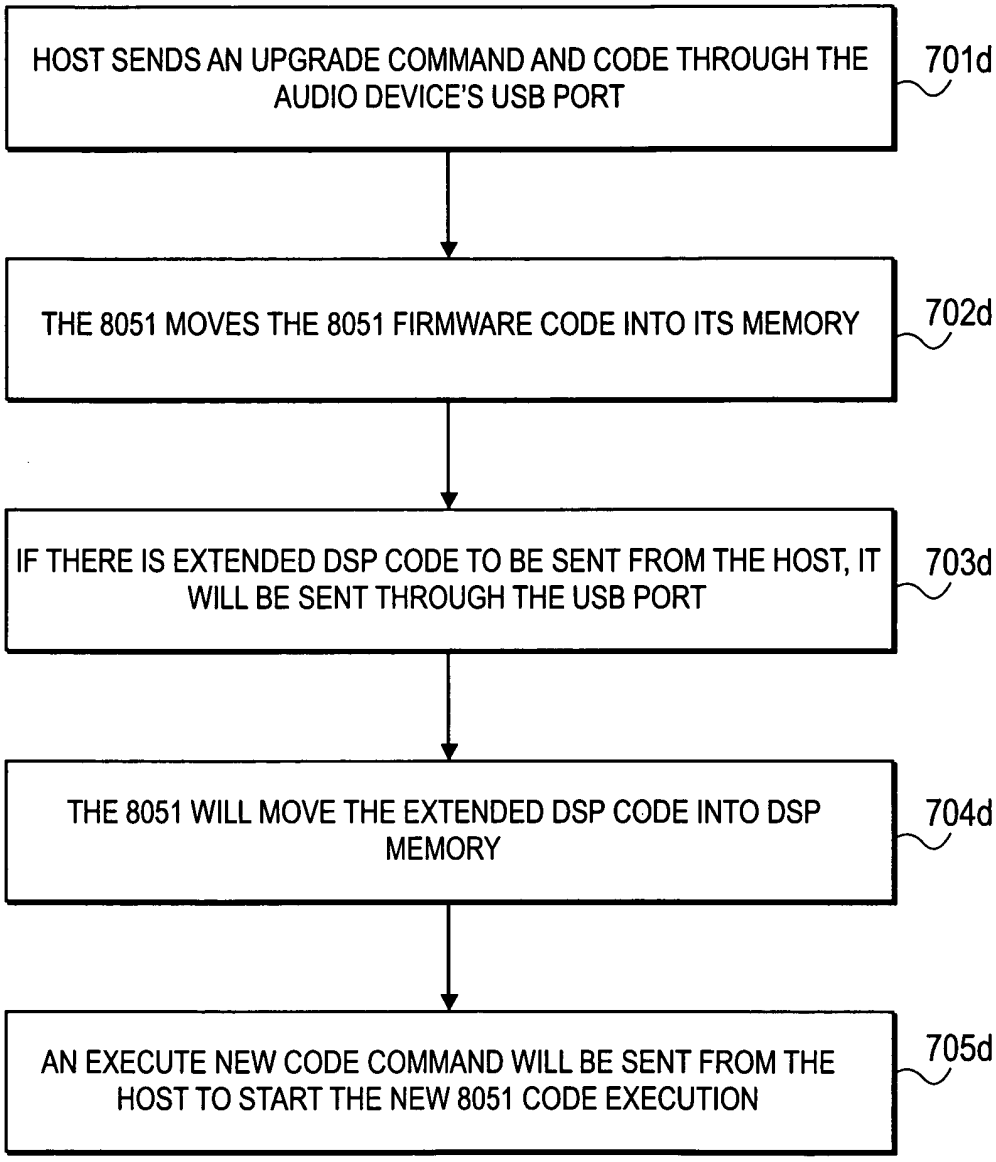
HOST SENDS AN UPGRADE COMMAND AND CODE THROUGH THE AUDIO DEVICE'S USB PORT
701d
THE 8051 MOVES THE 8051 FIRMWARE CODE INTO ITS MEMORY
702d
IF THERE IS EXTENDED DSP CODE TO BE SENT FROM THE HOST, IT WILL BE SENT THROUGH THE USB PORT
703d
THE 8051 WILL MOVE THE EXTENDED DSP CODE INTO DSP MEMORY
704d
AN EXECUTE NEW CODE COMMAND WILL BE SENT FROM THE HOST TO START THE NEW 8051 CODE EXECUTION
705d

FIG. 7D

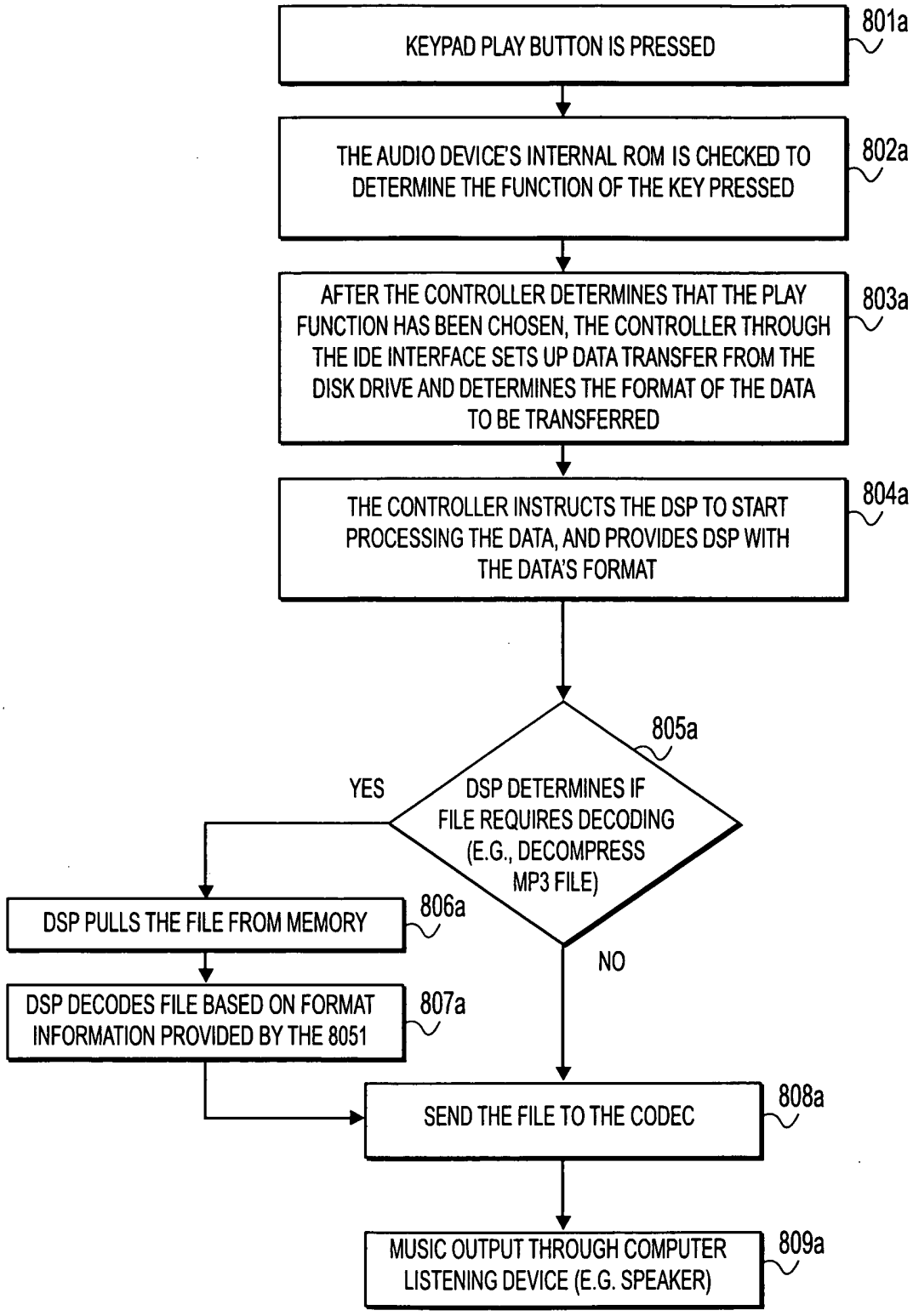
KEYPAD PLAY BUTTON IS PRESSED
801a
THE AUDIO DEVICE'S INTERNAL ROM IS CHECKED TO DETERMINE THE FUNCTION OF THE KEY PRESSED
802a
AFTER THE CONTROLLER DETERMINES THAT THE PLAY FUNCTION HAS BEEN CHOSEN, THE CONTROLLER THROUGH THE IDE INTERFACE SETS UP DATA TRANSFER FROM THE DISK DRIVE AND DETERMINES THE FORMAT OF THE DATA TO BE TRANSFERRED
803a
THE CONTROLLER INSTRUCTS THE DSP TO START PROCESSING THE DATA, AND PROVIDES DSP WITH THE DATA'S FORMAT
804a
DSP DETERMINES IF FILE REQUIRES DECODING (E.G., DECOMPRESS MP3 FILE)
805a
YES
NO
DSP PULLS THE FILE FROM MEMORY
806a
DSP DECODES FILE BASED ON FORMAT INFORMATION PROVIDED BY THE 8051
807a
SEND THE FILE TO THE CODEC
808a
MUSIC OUTPUT THROUGH COMPUTER LISTENING DEVICE (E.G. SPEAKER)
809a

FIG. 8A

801b

Audio Device pin name	Audio Device pin #	Function
Key0	64	Back plays the previous song on the play list
Key1	65	Skip jumps to the next song on the play list
Key2	66	Play/Pause toggles between Play and Pause
Key3	67	Stop/Eject/Load toggles between Stop, Eject and Load
Key4	68	Volume Down decreases the volume
Key5	69	Volume Up increases the volume
Key6	70	Mute volume
Key7	71	Lock. Once this key is pressed, all the other keys (0-6) are inactive

FIG. 8B

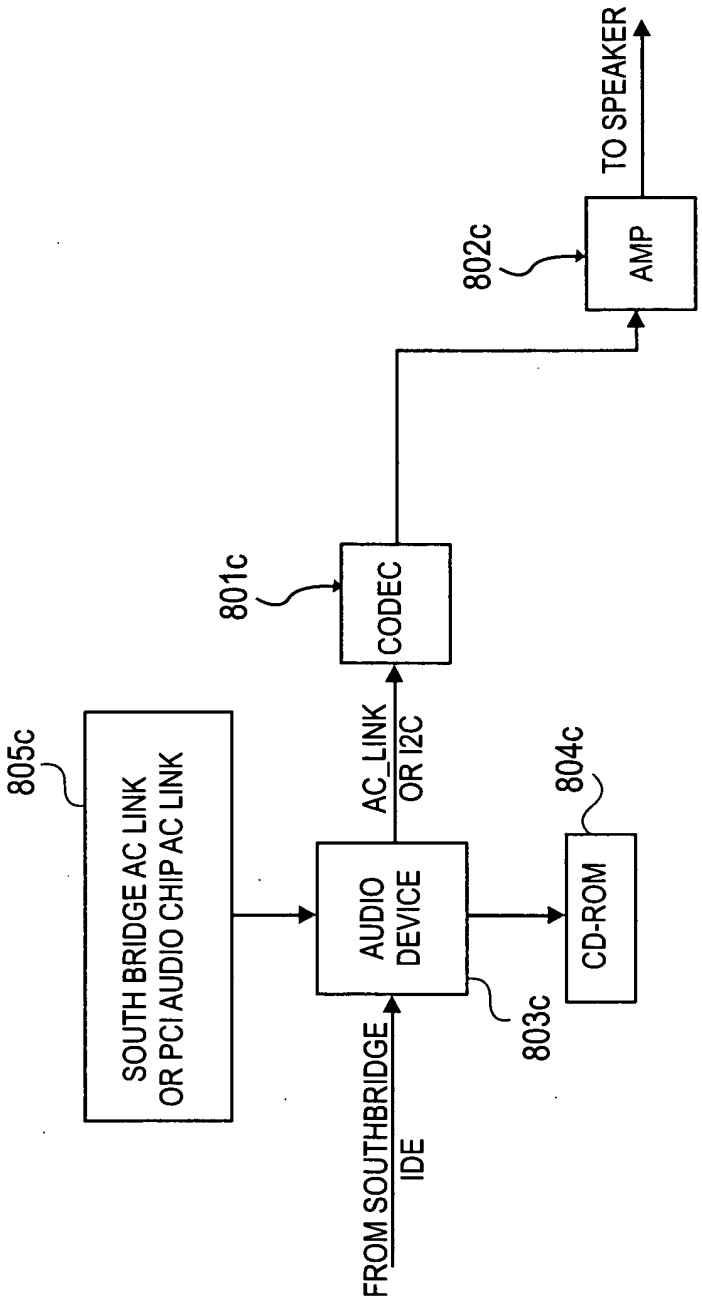
TO SPEAKER
802c
AMP
801c
CODEC
AC_LINK
OR I2C
805c
SOUTH BRIDGE AC LINK
OR PCI AUDIO CHIP AC LINK
AUDIO
DEVICE
804c
CD-ROM
803c
FROM SOUTHBRIDGE
IDE

FIG. 8C

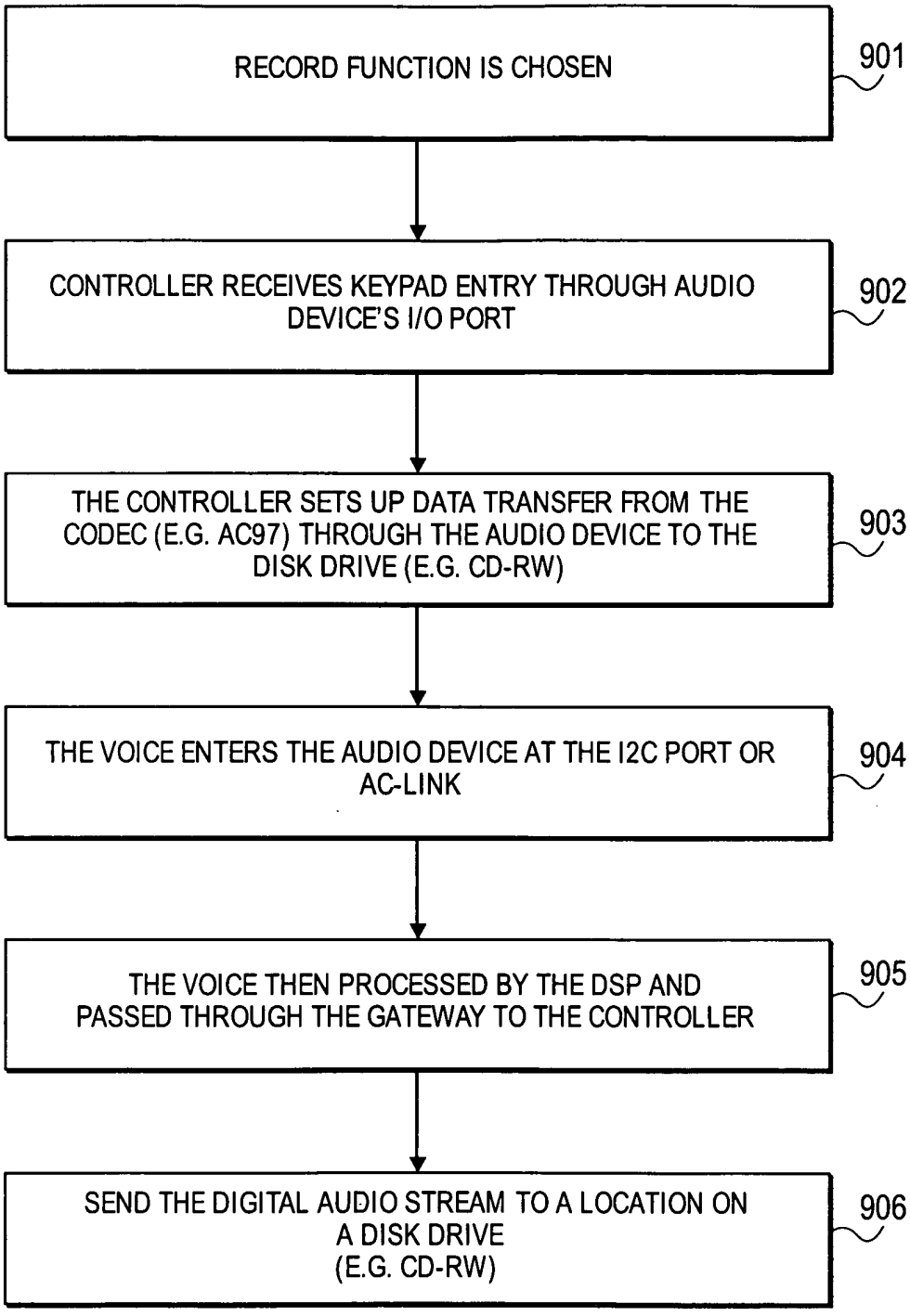
RECORD FUNCTION IS CHOSEN
901
CONTROLLER RECEIVES KEYPAD ENTRY THROUGH AUDIO DEVICE'S I/O PORT
902
THE CONTROLLER SETS UP DATA TRANSFER FROM THE CODEC (E.G. AC97) THROUGH THE AUDIO DEVICE TO THE DISK DRIVE (E.G. CD-RW)
903
THE VOICE ENTERS THE AUDIO DEVICE AT THE I2C PORT OR AC-LINK
904
THE VOICE THEN PROCESSED BY THE DSP AND PASSED THROUGH THE GATEWAY TO THE CONTROLLER
905
SEND THE DIGITAL AUDIO STREAM TO A LOCATION ON A DISK DRIVE (E.G. CD-RW)
906

FIG. 9

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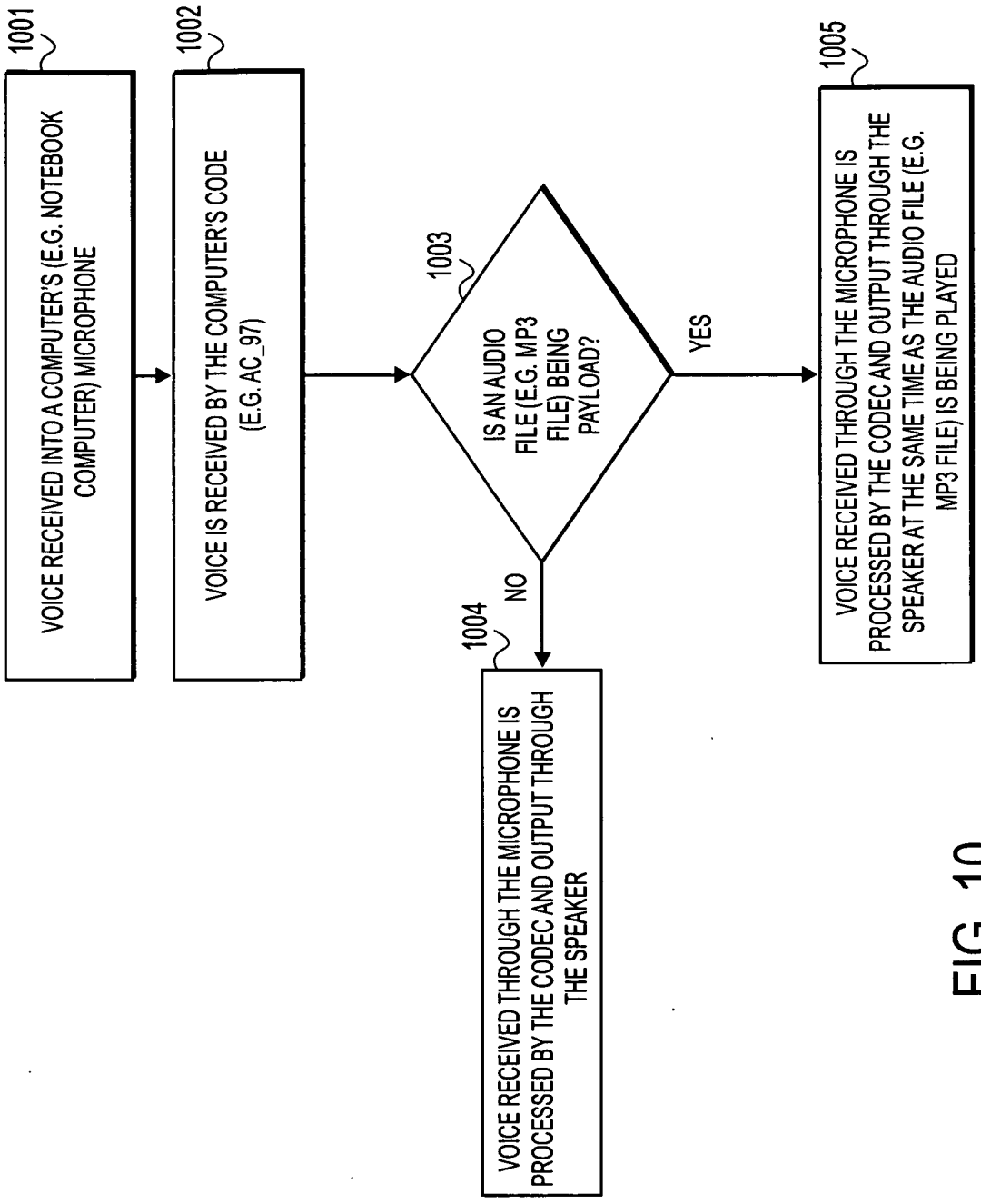

FIG. 10